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II. Solution by J. SCHEFFER, A. M., Hagerstown, Maryland.

Putting $(-10+9\sqrt{3}\sqrt{-1})=\rho(\cos\phi+\sin\phi\sqrt{-1})$, we get $\tan\phi=-\frac{9}{10}\sqrt{3}$. $\rho=\sqrt{343}$, and $(-10+9\sqrt{3}\sqrt{-1})^{\frac{1}{3}}+(-10-9\sqrt{3}\sqrt{-1})^{\frac{1}{3}}=2\sqrt{7}\cos\frac{1}{3}\phi$.

$$\therefore 4\cos^3\frac{1}{3}\phi-3\cos\phi+\frac{1}{4}\sqrt{7}=0.$$

By trial, $\cos\frac{1}{3}\phi=\frac{2}{7}\sqrt{7}$, and dividing the last trinomial by $\cos\frac{1}{3}\phi-\frac{2}{7}\sqrt{7}$, we get $4\cos^2\frac{1}{3}\phi+\frac{8}{7}\sqrt{7}\cos\frac{1}{3}\phi-\frac{5}{7}=0$; whence $\cos\frac{1}{3}\phi=-\frac{5}{14}\sqrt{7}$, $\cos\frac{1}{3}\phi=\frac{1}{14}\sqrt{7}$.

\therefore The three values required are 4, -5, 1.

Also solved by A. M. Harding.

GEOMETRY.

386. Proposed by DANIEL KRETH, Oxford, Iowa.

Construct the triangle, having given, the vertical angle, the sum of the three sides, and the perpendicular.

I. Solution by H. PRIME, Boston, Massachusetts.

Let ABC be the required triangle, C the given angle. On AB produced take $BE=BC$. On BA produced take $AF=AC$. Let O be the center of circle ECF . Then we have the angles $FOE=2(BEC+AFC)=ABC+BAC=\text{supplement of } C$.

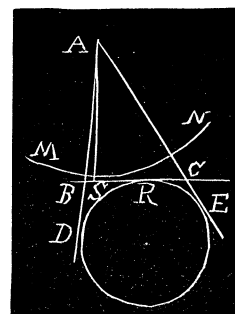
Hence, to construct the triangle, on EF —the given sum of the three sides form the isosceles triangle EOF , making EOF —the supplement of the given vertex angle (or $OEF=OFE$ —one half the given angle). About O as center describe the arc EF . Parallel to EF and at a distance from it equal to the given altitude draw a line meeting the arc at C and C' . Draw CA and CB , making the angles $ACF=AEC$ and $BCE=BEC$. ABC is the required triangle.

II. Solution by C. N. SCHMALL, New York City, and A. M. HARDING, University of Arkansas.

Construct an angle A equal to the given vertical angle. Lay off AD and AE each equal to *half* the given sum of the sides. Describe a circle touching these lines in D and E . With A as center and radius equal to the given perpendicular, describe a circle MN . By a well known method draw a line tangent to *both* these circles touching in R and S , respectively, and cutting the sides in B and C . Then ABC is the triangle required.

Proof. $BR=BD$, $CR=CE$.

$\therefore BC=BD+CE$; hence the triangle has the given perimeter. Also, AS is perpendicular to BC ; therefore the triangle has the required altitude. Q. E. D.



Also solved by J. Scheffer and A. H. Holmes.